

A method and a device for transporting identified packaging units

The present invention relates to a method and a device for individually transporting articles of different type, size, weight, material or shape, to one delivery location of a plurality of delivery locations that is designated for the respective article, as disclosed in
5 more detail in the preambles of attached claims 1 and 17.

To illustrate the prior art, reference is made to patent documents JP-10-174936, EP-B1-0212858, EP-B1-0532028, JP 10-000434, US-A-4465177 and EP-A1-0593374.

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There are also previously known solutions in which packaging units, after identification, can be moved by conveyor belts to delivery points that have gates, movable guides, drop doors or the like to divert an identified packaging unit to a delivery point designated therefor.

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Such known solutions are often mechanically complex and thus costly, and it has been an object of the present invention to be able to indicate a solution that is based on a continuously moving conveying system which is readily adaptable to the need for delivery locations, and which is mechanically simple in its structure and consists of few
20 parts of different types. Thus, the object of the invention is to provide a solution that is easy to maintain, reliable in operation and inexpensive.

According to the invention, the method is characterised by placing the articles one by one in respective transport containers, and causing the respective article at the desired
25 respective delivery location to be transferred from its transport container to a collecting or storage bin, disintegrator or further conveyor dedicated to the article, the transport container at the designated delivery location being caused to discharge the article from the container under the effect gravity or with the aid of a separate, controlled actuating means, and identifying the respective article at least as regards its material type prior to
30 it being placed in a transport container.

Additional embodiments of the method are set forth in attached, subsidiary claims 2-16.

The aforementioned device is characterised, according to the invention, by a plurality of
35 transport containers arranged to move in spaced apart relation along a circular transport path as an endless, moving row of containers, each designed to hold just one single article, means for identifying each article at least as regards its material type prior to a

location at which packaging units can be placed singly in respective transport containers, and an actuating means located at each delivery location in order, in activated position related to an identified article, to cooperate with a respective transport container to remove the identified article in the container from the container at its
5 designated delivery location, said actuating means in an inactive position being adapted to selectively allow a container to pass the delivery location or locations to which it is not related without being actuated.

Additional embodiments of the device are set forth in attached, subsidiary claims 18-
10 33.

The invention will now be explained in more detail with reference to the attached figures which show exemplary embodiments that are non-limiting for the invention.

15 Fig. 1 is a perspective view of the basic structure of a currently preferred embodiment of the device according to the invention.

Fig. 2 is a perspective view of the device from another angle.

20 Fig. 3 is an enlarged, side elevational view of a modification of the device seen in Figs. 1 and 2.

Fig. 4 is a block diagram of the signal structure of the device according to the invention.

25 Fig. 5 shows detail of the device in connection with a non-activated control means.

Fig. 6 shows detail of the device in connection with an activated control means, and Fig. 7 shows further details in connection with a toothed engaging element for controlled inversion of a transport container.

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Figs. 8-11 shows further details in connection with the inversion of a transport container.

Fig. 12 is a perspective view of the toothed engaging element.

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Fig. 13 is a perspective view of detail of bearing and guide pins on a transport container.

Fig. 14 is a sectional view of the device in connection with the transition from horizontal to vertical movement of transport containers.

Fig. 15 is a sectional, perspective view of the principle of the mode of operation of a second embodiment of the device according to the invention.

Fig. 16 is a sectional, perspective view of the principle of the mode of operation of a third embodiment of the device according to the invention, and Fig. 17 shows detail of this embodiment.

Figs. 18 and 19 are respectively a sectional perspective view and a side view of a container according to a fourth embodiment of the device.

Figs. 20 and 21 shows two alternative solutions for ejection of an article from a container as shown in Figs. 18 and 19.

Fig. 22 is a sectional, perspective view of the principle of the mode of operation of a fifth embodiment of the device.

The invention is designed to individually transport identified packaging units 1, 2 to a delivery location designated for the respective identified packaging unit, such as one of, for example delivery locations 3, 4 or 5 shown in Fig. 1 or 6, 7 shown in Fig. 3. Although only two container feed locations 8, 9 are shown, it will be understood that there may be more than these two, but optionally just one.

Figs. 1-3 show a plurality of bucket-shaped or trough-shaped transport containers 10. The containers 10 are arranged to move as a endless row in a certain spaced apart relation along a circular path, having both two horizontal sections 11, 12 and two vertical sections 13, 14; cf. Fig. 2.

The control means 15, 16, 17 (Fig. 2) or 18, 19 (Fig. 3) is positioned at respective generally indicated delivery locations 3, 4, 5 or 6, 7. These delivery locations may, for example, consist of a dedicated collecting or storage bin, disintegrator or further conveyor.

When a packaging unit, as for instance a bottle 1 or a beverage can 2 is inserted into a reverse vending machine 20 on a conveyor 21, the packaging unit will be detected by

detector device 22, and detector device 22 will communicate with a signal processing unit 23. The detector device 22 may be a known type and designed to detect, for example, one or more of the following parameters: the material of the packaging unit, for example, using spectrometry; colour; shape, reading of characteristics, for example, optically, magnetically, using RF technology or the like; weight; type of metal or presence of metal. Referring to Fig. 1, the unit 23 will selectively activate one of the control means 15-17 via a respective signal line 15', 16' or 17', so that the discharging of the packaging unit 1, 2 from a container 10 can take place at the desired delivery location by rotation of the container 10, as will be explained in more detail. The unit 23 also communicates with a drive motor 24 that is arranged to operate drive wheels 25, 26 (see Fig. 1). A detector 27 that is connected to the unit 23 detects rotation of the drive wheels 25, 26 and is thus also provided with information about the rotational position of the drive wheels and thus the respective position of the containers 10 in the path. The unit 23 is also arranged to be able to communicate with an operating and display panel 28 on the reverse vending machine.

The transport containers 10 are arranged to be moved along the path using a chain or line, generally indicated by the reference numerals 29, 30. The containers have a bearing pin on each gable thereof, and this pair of pins is axially aligned and rotatably supported in holders 32 on the respective chain or line. The chains or lines 29, 30 are driven purely generally by drive wheels 25, 26 controlled by the motor 24, the holders 32 together with additional position holders 33 forming successive engagement with recesses 25', 26' on the drive wheels for controlled propulsion of the containers 10 as the drive wheels rotate. The said holders 32, 33 on the chains or lines are also arranged for successive cooperation with corresponding recesses 34', 35'; 36', 37' and 38', 39' on at least three pairs of guide wheels or reversing wheels 34, 35; 36, 37 and 38, 39. The holder 33', see Fig. 10, has the same function as a holder 33, but is shown here as a connecting piece-configured holder.

The signal processing unit 23 will, in response to detected and identified packaging unit 1, 2, move an associated control means 15-17, 18, 19 into activated position, and the associated delivery location is thus related to the identified packaging unit that is placed in a container 10.

In Fig. 5 it is shown how containers 10 will be able to pass a sorting means, in this figure, for example, the means 16, when this has not been activated, and also be able to pass unactuated by a toothed engaging element 40, i.e., so that the containers are not

permitted to turn because of a guide pin 41 that is found on both gables of the container and which remains in place along the underside of an element 40 on each side of the path. A guide strip 42 on which the holders 32 are arranged to slide in the horizontal parts of the path, as indicated in Figs. 1 and 8, is for the sake of simplicity not included in Figs. 6, 7, 9-11. The holders 32, 33 and drive chain or line are also not included in Figs. 5-7.

In Fig. 6 and also especially in Fig. 7 it is shown what happens when the means 16 is activated to cause a container to be inverted so as to discharge a packaging unit placed therein. The means 16 consists of a guide flap that is arranged to cooperate with the guide pin 41 which is a part of engaging means mounted on the gables of the container 10. The guide flap 16 is preferably controllable by a small motor 16'. When the container 10 at the same time is driven forwards in the path by the drive wheels 25, 26, the pin 41 will cooperate with the flap 16 and then with a slot 43 located downstream in the element 40. A turning of the container 10 is thus already underway. Additional guide pins 44-47 that are a part of the engaging means on the container 10 will successively engage with the engaging element 40. First the pin 44 will slide down along an inclined plane 48 and enter engagement with a recess 49. Then the pin 45 will enter the recess 50, whereupon the pin 46 enters the recess 51, whilst the pins 44, 45 are already in the process of moving out of their respective recesses. The pin 47 subsequently engages with a recess 52, whereupon the pin 41 ultimately passes through a slot 53 on the element 40. A forcibly controlled 360° rotation of the container 10 has thus been carried out.

In this way, it will be possible to invert the container controllably so as to tip the identified packaging unit 1; 2 lying in the container out of the container under the effect of gravity at its designated delivery location.

When the containers 10 are moved vertically, as shown in an enlarged view in Fig. 14, the containers will, because their bearing point via the bearing pin 31 in the holder 32 lies above the centre of gravity of the container, prevent rotation of the container.

It will be seen that the containers are supported in said chains or lines in a fixed spaced apart relation, as the spacing between, *inter alia*, the holders 32 is the same along the whole path. However, the spacing between the containers will vary slightly when, for instance, inversion takes place or when they are moved in the vertical part of the path.

In the solution shown in Figs. 1-14 it is seen that the transport container 10 is a partly open container, e.g., bucket-shaped or trough-shaped, in order that, at the designated delivery point 3, 4, 5, 6 or 7, it can be made to invert so as to discharge the article 1; 2 under the effect of gravity.

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Fig. 15 shows a solution in which an article may be discharged from a transport container 60 by gravity when an actuating means 61 is activated to cause the transport container bottom to open in that that two parts 60', 60" of the container move apart. The transport container 60 is suspended from a pair 62, 63 of lines or chains via suspension fitting mounting 64, 65. The two parts 60', 60" are rotatably fastened to the fittings 64, 65 at pivot points 66, 66' and 67, 67'. The two parts 60', 60" are rotatably interacting with the aid of toothed portions 68, 68'; 69, 69'. The actuating means 61 is movable downwards to a 61' where it will enter sliding engagement with an actuating pin 70 on the part 60'. By letting the pin rides on the actuating means 61, the pin will be made to gradually move upwards along the means 61 and then along the upper side of a stationary pin-slide 71. At a downstream end 71' of the slide 71, the pin 70 moves downwards again, whereby the two parts 60', 60" move towards each other. Similarly, on the part 60" at the opposite end of the container 60 there will be provided an actuating pin 72 that is designed to ride on a stationary pin-slide (not shown) which is located downstream of the slide 71. In connection with this non-illustrated slide it is not necessary to have an actuating means, like the means 61, as the rotation of the part 60' also causes forced rotation of the part 60" via the toothed portions 68, 68' and 69, 69'.

Figs. 16 and 17 show a container 74 which via suspension 75, 76 is fastened to a pair of transport lines or chains 77, 78. The container has a laterally rotatable bottom part 79 which is preferably supported in said suspension 75, 76 via end pieces 79', 79". One of the end pieces, e.g., 79', is provided with an engaging pin 80 arranged to engage with an actuating lug 81 which, as shown in Fig. 17, is movable from an inactive position 81' to an active position 81". When the containers move in the direction of the arrow and the lug 81 is put in the active position, the pin 80 will abut against the lug 81 and cause the bottom 79 to be pushed sideways relative to the length of the container 74, whereby an article in the container will fall out under the effect of gravity. When the containers have moved sufficiently in the direction of the arrow, the pin 80 will ultimately slide over the top of the lug 81, whereupon the bottom 79 will return to a normal position as shown for the container to the far left in Fig. 16.

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Figs. 18 and 19 show another solution in which the container 82 has an opening 82', 82" at both ends. The container is via suspension 83, 84 suspended from lines or chains 85, 86. When it is desirable at a designated location to remove an article 87, e.g., a bottle, from the container 82, an ejector mechanism can be used to push the article out of the container. Such an ejector mechanism may, e.g., be a quick-acting electrically (e.g., solenoid) or pneumatically operated device with a pusher 88. Fig. 20 shows a pneumatic ejector mechanism with a pressure source 89, control valve 90, and pneumatic cylinder 91 with associated, spring-loaded piston 92. In the alternative solution shown in Fig. 21, it is envisaged that a powerful high-pressure air stream 93 is used which comes from a pressure source 94 via control valve 95 and a nozzle 96.

In the solution shown in Fig. 22 a container 97 is provided that is closed at one end 98 and open at the other end 99. The container 97 is pivotally fitted to a container support frame 100 at the open end 98 of the container via a hinge 101. The support frame 100 is via suspension 102, 103 fastened to a pair of lines or chains 104, 105. Secured to the outside of the end 98 of the container, which consists of an end gable, is a projecting engaging pin 106. On actuation of an electric or pneumatic quick-acting actuating means 107 which has a pusher 108, the container 97 will, upon the sharp "kick" of the pusher on the pin 106 in the upward direction, be caused to tilt about the hinge 101, whereby the article, e.g., a bottle 109, will slide out of the container 97 via the opening 99 at the desired discharge location.

In Fig. 3 it is shown how, for example, at least one camera 110; 110'; 110" may be mounted above the transport path to cooperate with an article recognition means to establish one of the following features: that just one article is in the dedicated transport container, that the transport container is emptied at the desired article delivery location, that the article is not a strange article, and that the article is in a unitary state. It is also possible to envisage that such a camera is capable of identifying the article whilst it is in the transport container, for example, as regards material type. Fig. 4 shows how connection may be made to a signal processing unit.

From the above description and from the drawings it will be clear, *inter alia*, that the transport container in a controllable manner is temporally actuated to discharge an article that is located therein. The transport containers preferably move at a constant speed in a circular path of movement with adjacent containers preferably spaced apart at a fixed distance, as an endless moving row of containers. Such a circular path has both horizontal and vertical portions.

Although it is basically possible to envisage the invention used for the transport and discharge of several types of articles, the articles according to a preferred use of the invention are empty packaging units, e.g., cans of metal or plastic, or bottles of plastic
5 or glass.